

A marked-up version showing amendments to any claims being changed is provided in one or more accompanying pages separate from this amendment in accordance with 37 CFR § 1.121(c)(1)(ii). Any claim not accompanied by a marked-up version has not been changed relative to the immediate prior version, except that marked-up versions are not being supplied for any added claim or canceled claim.

CLAIMS

1. (Amended) A method of bonding balls of solder to bond pads on a substrate comprising:

dipping the substrate into a volume of the balls of solder;

contemporaneously retaining at least two of the balls of solder over different respective bond pads on the substrate in absence of flux; and

with the at least two balls of solder so retained, exposing the at least two balls of solder to bonding conditions effective to bond the at least two balls of solder with the associated bond pads.

2. (Amended) The method of claim 1, wherein the exposing comprises laser-bonding the at least two balls of solder.

4 3. (Amended) A method of bonding balls of solder to bond pads on a substrate comprising:

placing at least portions of a plurality of balls of solder within a frame and in registered alignment with individual bond pads over the substrate by dipping the substrate into a volume of the balls of solder; and

while the ball portions are within the frame, exposing the balls of solder to bonding conditions effective to bond the balls of solder with the associated bond pads.

5 8. (Amended) The method of claim 3, wherein the exposing comprises laser bonding the balls with the associated bond pads.

6 8. (Amended) The method of claim 3, wherein the exposing comprises laser bonding the balls with the associated bond pads by fixing the position of a laser beam and moving the frame relative to the laser beam from one of the balls to another of the balls.

7 11. (Amended) The method of claim 3, wherein:
the placing comprises placing individual balls within individual holes within the frame; and
the exposing comprises reflowing the balls while the balls are within the individual holes, and further comprising, after reflowing, removing the frame from around the reflowed balls.

8 13. (Amended) A method of bonding balls of solder to bond pads on a substrate comprising:

145 providing a frame having a plurality of holes sized to receive individual solder balls;

delivering the individual balls of solder into the holes from over the frame by dipping the substrate into a volume of the balls of solder;

placing the balls into registered alignment, while the balls are in the holes, with a plurality of individual associated bond pads over the substrate; and

bonding the balls with the individual associated bond pads.

1469 20. (Amended) The method of claim 13, wherein the bonding comprises laser bonding the balls with the individual associated bond pads.

10 22. (Amended) The method of claim 13, wherein the bonding comprises laser bonding the balls with the individual associated bond pads by fixing a position of a laser beam and moving the frame relative to the laser beam from one of the balls to another of the balls to effectuate the bonding.

11/ 23. (Amended) A method of bonding solder balls to bond pads on a substrate comprising:

providing a frame having a plurality of holes;

inserting individual solder balls into the holes by dipping the substrate into a volume of the balls of solder, the balls being small enough to pass through the holes;

placing the frame into proximity with the substrate having bond pads positioned thereon, more than one of the plurality of holes individually holding an individual solder ball therewithin and in registered alignment with an associated bond pad on the substrate;

laser-bonding the solder balls to the associated bond pad; and

after the laser bonding, removing the frame from proximity with the substrate.

28/ 26. (Amended) The method of claim 23, wherein said laser-bonding comprises moving the individual solder balls relative to a generally-fixed laser beam.

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13 27. (Amended) A method of bonding a ball of solder to a bond pad on a substrate comprising:

providing the frame having a hole;

providing a ball of solder having an outer surface;

retaining the ball of solder within the hole in an ambient processing environment which is generally uniform over an entirety of the outer surface of the ball by dipping the substrate into a volume of balls of solder; and

while the ball of solder is within the hole, bonding the ball of solder with an associated bond pad on the substrate.

14 30. (Amended) The method of claim 27, wherein the bonding comprises laser bonding the ball.

15 31. A method of bonding balls of solder to bond pads on a substrate comprising:

providing a surface having a plurality of holes therein;

providing a plurality of balls of solder over the surface by dipping the substrate into a volume of the balls of solder;

depositing some of the balls of solder into at least some of the holes; and

bonding the balls of solder which were deposited into the holes to individual associated bond pads positioned on the substrate proximate the holes.

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I 16 140 36. (Amended) The method of claim 31, wherein the bonding comprises laser-bonding each ball to an associated one of the individual associated bond pads.

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14 37. (Amended) The method of claim 31, wherein the bonding comprises laser-bonding each ball to an associated one of the individual associated bond pads by fixing a position of a laser beam and moving each ball into a path of the laser beam.

113 45. (Amended) The method of claim 1, wherein the exposing comprises melting the at least two balls.

118 48. (Amended) A method of bonding balls of solder to bond pads on a substrate comprising:

112 placing at least portions of a plurality of balls of solder within a frame and in registered alignment with individual bond pads over the substrate by dipping the substrate into a volume of the balls of solder; and

while portions of the balls of solder are within the frame, exposing the balls to bonding conditions effective to bond the balls with the individual bond pads by laser bonding the balls with the individual bond pads.

119 49. (Amended) The method of claim ¹⁸48, wherein the exposing the balls to bonding conditions effective to bond the balls comprises laser bonding the balls with the individual bond pads by fixing a position of a laser beam and moving the frame relative to the laser beam from one of the balls to another of the balls.

20 50. (Amended) The method of claim ¹⁸48, wherein:
the placing comprises placing individual balls within individual holes within the frame; and

the exposing the balls to bonding conditions effective to bond the balls comprises reflowing the balls by laser bonding while the balls are within the individual holes, and further comprising, after reflowing, removing the frame from around the reflowed balls.

21 51. (Amended) A fluxless process for bonding balls of solder to bond pads on a substrate comprising:

placing at least portions of a plurality of balls of solder within a frame and in registered alignment with individual bond pads over the substrate by dipping the substrate into a volume of the balls of solder; and

while portions of the balls of solder are within the frame, laser bonding the balls with the individual bond pads by laser bonding the balls of solder to the individual bond pads using a fixed laser beam.

22 52. (Amended) The fluxless process of claim 51, wherein the laser bonding the balls to the individual bond pads comprises fixing a position of the laser beam and moving the frame relative to the laser beam from one of the balls to another of the balls.

23 53. (Amended) The fluxless process of claim 51, wherein:
the placing comprises placing individual balls of solder within individual holes within the frame; and

the laser bonding the balls to the individual bond pads comprises reflowing the balls by laser bonding while the balls are within the individual holes, and further comprising, after reflowing, removing the frame from around the reflowed balls.

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